



Psychometric Properties of the Turkish Version of the Developmental Support Competency Scale for Nurses (DSCS-N)

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ARTICLE INFO

Article history:

Received 6 March 2020

Revised 25 April 2020

Accepted 25 April 2020

Keywords:

Developmental support competency

Newborn nursing

Developmental care

Scale

Psychometric properties

ABSTRACT

Purpose: Developmental care is considered an important component of development and health promotion of premature infants, however, studies regarding assessment of nurses' competency of developmental care are inadequate. This study is designed to determine the psychometric properties of the Turkish version of the Developmental Support Competency Scale for Nurses (DSCS-N).

Design and methods: This methodological study includes 140 nurses working at a tertiary level neonatal intensive care unit (NICU). Data were collected using the Nurse Introductory Form and Developmental Support Competency Scale for Nurses. The scale was assessed in terms of language and content validity, construct validity, internal consistency and time invariance.

Results: The scale consisted of 19 items and six subscales. In the confirmatory analysis, which is a validity analysis, it was found that the scale's factor loadings ranged between 0.27 and 0.92, and the ratio of chi-square to degrees of freedom was 1.64. Other fit indices (CFI = 0.96, NFI = 0.92, NNFI = 0.95) were at desirable levels. Cronbach's alpha coefficient was found to be 0.90. According to item analysis results, item-total correlations ranged between 0.26 and 0.66. It was found that nurses' responses to the scale items at two different times were consistent and did not change over time ($p > 0.05$).

Conclusions: DSCS-N is a valid and reliable scale for measuring Turkish nurses' competency of developmental support.

Practice implications: DSCS-N can be used as a tool contributing to the implementation of developmental care. The scale can help nurses working in neonatal intensive care units to determine their competency of developmental care.

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Introduction

Premature birth is a condition that occurs before the 37th week of pregnancy and leads to complications and high rates of mortality and morbidity (WHO, 2020). Recent technological advances in neonatal intensive care have increased neonatal and premature infants' chances of surviving and thriving in neonatal intensive care units (NICU) (Altimier & Phillips, 2013; Montirosso et al., 2018). NICU is an environment where neonates continue to develop outside of the protective uterine environment. Neonate encounter serious overstimulation of their sensory environment (Altimier & Phillips, 2013; Altimier & Phillips, 2016; Johnston et al., 2011). Developmental supportive care approach is adopted to help the neonate improve the adaption to extrauterine life in the

intensive care unit and continue their development and growth (Als, 2009; Mosqueda et al., 2013).

Developmental supportive care is a methodical approach of learning behavioral patterns of the neonate and especially premature infants. This care reduces stress and long term neurodevelopmental issues of the infant and increases comfort (Als, 2009; Mosqueda et al., 2013; Pineda et al., 2013). Neonatal intensive care nurses are the primary staff members in developmental supportive care practices (Park & Kim, 2019). Assessing developmental care needs of infants in NICU and providing developmental care in every nursing process is a primary role and responsibility of the neonatal intensive care nurses (Coughlin, 2014). A neonatal intensive care nurses' competency and education in developmental care can support physiologic and neuromotor development of the infant by reducing premature infants' stress (Hunter, 2010; Kim & Shin, 2016).

Developmental care is the most important component of care provided in the NICUs, however, knowledge levels and practices of nurses in developmental care are inadequate (Aydın & Karaca Çiftçi, 2015; Çağlar et al., 2019; Kim & Shin, 2016). Factors such as education level,

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nurses' experience, nursing working environment (ex. patient load, working hours), developmental care perception, individual professional efficacy can all affect nurses' implementation of developmental care (Kim & Shin, 2016; Mosqueda et al., 2013; Park & Kim, 2019; Soleimani et al., 2017; Zhang et al., 2016). In Turkey, neonatal intensive care nurses' competency of developmental supportive care could not be assessed because there is no such scale available.

Purpose

This study aimed to perform validity and reliability study of the Turkish version of the "Developmental Support Competency Scale for Nurses (DSCS-N)" developed to measure nurses' competency of developmental support of premature infants.

Methods

Study design

This study was conducted methodologically to investigate the validity and reliability of the Turkish version of the Developmental Support Competency Scale for Nurses (DSCS-N).

Setting and sample

Data were collected in two hospitals at a city located in western Turkey between May and October 2019. The study population included 161 nurses working at neonatal intensive care unit in the city. Study sample size was determined in accordance with the principal that suggests sample size be a minimum of five times more than the number of scale items and a maximum of ten times more (Esin, 2014; Tavşanlı, 2014). Therefore sampling was not selected and it was planned to reach all the nurses working nurses in the NICU. Ten nurses who were included for pilot study; 11 nurses who did not want to participate in the study and did not complete the data collection tools, were excluded from the study. The tool was administered to 140 nurses. The inclusion criteria of the study were to work in the NICU for at least six months as a nurse and to volunteer to participate in the study.

Data collection tools

Nurse Introductory Form

This form included questions regarding sociodemographic characteristics (age, gender, education etc.) of the nurses.

Developmental Support Competency Scale for Nurses (DSCS-N)

DSCS-N was developed by Kim and Shin (2016) to assess the neonatal intensive care nurses' competency of developmental supportive care practices (Kim & Shin, 2016). DSCS-N is a 4-point Likert-type scale which is composed of 19 items and 6 subscales, and is scored between 1 and 4 (1. Never, 2. Sometimes, 3. Frequently 4. Almost always), the lowest point possible on this scale is 19 and the highest is 76. The subscales are as follows: environmental support (4 items about the environment that promotes neuromotor development), parental support (3 items that includes nursing care to meet parental needs), interaction (3 items regarding recognition and reflection of infant behavioral cues), critical thinking (3 items that contains nurses' ability to make decisions and integrate knowledge), professional support (3 items about practices for nurses to develop themselves professionally) and partnership (3 items that includes collaboration with other healthcare professionals). The Cronbach's α coefficient of the scale was found to be 0.83 and that of the subscales ranged between 0.60 and 0.76 (Kim & Shin, 2016).

Translation and adaptation of the DSCS-N

Permission was obtained to adapt the scale to Turkish from the authors who developed the original scale through email, then it was adapted to Turkish society. The scale was translated from English into Turkish by three expert translators. The back-translation of the Turkish version was performed by an expert translator who speaks both the languages. The scale items were created by the researchers by comparing the expressions in Turkish and English together with the expert translator who completed the back-translation. The Turkish form and the original form were presented to ten experts to determine both language and content validity. Experts were PhD in pediatric nursing, and had research experience about developmental care of newborns. Expert group should be compromised of at least three and at most 20 people (Esin, 2014). Expert views were assessed using content validity index (CVI) and the Davis method (Zamanzadeh et al., 2014). Compatibility level of the expert views were analyzed using Kendall's W test, a non-parametric test.

Pilot implementation was carried out with ten nurses who fit the inclusion criteria after the expert views were obtained (Esin, 2014). No modifications were made, because each item was found understandable in pilot study.

Data collection

To collect data, nurses in the clinics were approached and necessary explanations were given regarding the study. The nurses who gave written and verbal consent were included in the study. Nurses were asked to complete the data collection forms. The data collection forms were completed with self-reporting during nurses' work shift. This took between 5 and 10 approximately minutes.

Ethical considerations

The study was approved by the Clinical Research Ethics Committee of the Faculty of Medicine (IRB number: E.74826, Approval date: 06.03.2019). The nurses were informed about the study and verbal and written informed consents were obtained.

Data analysis

Statistical analysis was performed using the PASW 18 and LISREL. Descriptive characteristics were evaluated by number, percentage, mean and standard deviation in the analysis of the data.

Content and structural validity was assessed in regard to validity of DSCS-N. In the study, Kendall's W coefficient of concordance and content validity index was calculated (with Davis method) for content validity. Structural validity of the scale was tested using confirmatory factor analysis. Minimum factor load was set as 0.30 in the confirmatory factor analysis (Büyükoztürk, 2002).

In this study, internal consistency and time invariance were reviewed to assess the reliability of the scale. Internal consistency was determined using Cronbach's alpha reliability coefficient, item-total score correlations and Hotelling T^2 test. Minimum item-total score correlation coefficient was set as 0.25 (Büyükoztürk, 2002). Test-retest method was used to assess time invariance of the scale. Suitability between test-retest mean scores were assessed using Pearson Product-Moment Correlation Coefficient analysis, and differences between test-retest mean scores were assessed using dependent samples *t*-test.

Results

Sample characteristics

Mean age of the participating nurses was 32.79 ± 7.11 and all were female. Participants' mean length of employment as a nurse was 11.31 ± 7.21 years, their mean length of employment as a NICU nurse was 7.68 ± 4.68 years. Of the nurses, 64.3% had a bachelor's degree and 79.3% received training on developmental care (Table 1).

Table 1
Demographic characteristics of nurses.

Descriptive characteristics	Mean	SD
Mean age of the nurses	32.79	7.11
Years of experience as a nurse	11.31	7.21
Years of experience in the NICU	7.68	4.68
Number of patients per nurse	3.86	1.84
Educational background	Number	Percentage
High school	15	10.7
Associate degree	14	10.0
Bachelor's degree	90	64.3
Postgraduate	21	15.0
Training on developmental care		
Yes	111	79.3
No	29	20.7

Validity

The Davis method was used to assess the expert opinions obtained for content validity of the scale. CVI of the scale items ranged between 0.90 and 1.00. Expert opinions obtained for content validity were assessed using Kendall's W coefficient of concordance (Kendall's W = 0.131; $p = 0.166$; $p > 0.05$). There was no difference between experts in terms of the score they gave.

Confirmatory Factor Analysis (CFA) was performed to test the suitability of the factor structure of the scale. Chi square value was 225.02, degrees of freedom was 137, and p -values were 0.000. Ratio of chi-square to the degrees of freedom was calculated as 1.64. Root Mean Square Error of Approximation (RMSEA) was 0.068, Goodness of Fit Index (GFI) was found 0.85, Adjusted Goodness of Fit (AGFI) was 0.80, Comparative Fit Index (CFI) was 0.96, Normed Fit Index (NFI) was 0.92, and Non-Normed Fit Index (NNFI) was 0.95 (Table 2). Because GFI and AGFI values showed a low level of suitability, modifications were performed in line with those recommended as a result of confirmatory analysis. However, p -value was found to be 0.13 after the modification and since it was <0.01 the modification was ignored.

Fig. 1 shows the factor loadings regarding model. In the figure, values on the left show the error variance, and values in the middle show factor loading. Because reviews found V16 error variance as 0.93, t -values were assessed but the 16th item was not removed from the scale due to the fact that its t -values were significant.

Reliability

Item analysis was performed to determine the scale items' contribution to total scale score and the relationship with the entire scale. The

Table 2
Confirmatory factor fit index results of the Developmental Support Competency Scale.

Measure of harmony	Value
χ^2 /sd	1.64
RMSEA ^a	0.068
GFI ^b	0.85
AGFI ^c	0.80
CFI ^d	0.96
NFI ^e	0.92
NNFI ^f	0.95
Factor load (min-max.)	0.27–0.92

^a Root mean square error of approximation.

^b Goodness of fit index.

^c Adjusted Goodness of Fit.

^d Comparative fit index.

^e Normed Fit Index.

^f Non-Normed Fit Index.

item total correlation coefficient was analyzed. Analysis of item total score correlations of the scale showed that item-total correlations ranged between 0.26 and 0.66. The difference between scale items was highly significant (Hotelling $T^2 = 567.7$, $p = 0.000$). Cronbach's alpha coefficient was calculated as another method to determine internal consistency of the scale. Cronbach's alpha coefficient was found to be 0.90. Cronbach's alpha coefficients for the six subscales were respectively 0.85, 0.78, 0.81, 0.74, 0.67 and, 0.81 (Table 3).

Data were collected again three weeks after the first session with a total of 30 nurses to assess time invariance of the scale. To examine the correlation between the data collected the first and second time, the Pearson product-moment correlation was used. The difference between mean scores obtained from test-retest was compared using the dependent samples t -test. There was no statistical difference between nurses' DSCS-N mean scores obtained from two different measurements performed at the three week interval ($p > 0.05$; Table 4). In analyzing the relationship between the scores obtained from the first and second administration carried out as a reliability analysis of DSCS-N, it was found that there was a positive, strong and statistically significant relationship between those two measurements ($p = 0.000$; $r = 0.99$; Table 4).

Discussion

DSCS-N was developed to improve NICU nurses' competency of developmental care of premature infants (Kim & Shin, 2016). There is no measurement instrument to determine nurses' competency of developmental care in Turkey. There is a need for reliable and valid scales on this topic.

Firstly, language and content validity studies were performed to adapt DSCS-N to the Turkish language in this study. CVI values were calculated for content validity of the scale. In the Davis method used to calculate CVI value, experts are asked to score each item as (a) suitable, (b) item should be somewhat reviewed, (c) item should be definitely reviewed, (d) item is not suitable. In this method, the CVI of the item is obtained by dividing the number of experts who choose the options (a) and (b) to the total number of experts. The standard for the calculated CVI value was accepted as 0.80. (Esin, 2014; Zamanzadeh et al., 2014). Kim and Shin (2016) determined the total CVI of the scale as 0.90; revised the scale items below 0.80 and finalized the scale (Kim & Shin, 2016). CVI values of DSCS-N scale items ranged between 0.90 and 1.00 and it was detected that scale items represented situations, intended to be measured, at a good level.

Confirmatory Factor Analysis (CFA) was performed to test the suitability of the factor structure of the scale. Goodness of fit statistics are required to be at desired level in confirmatory factor analysis. When the ratio of chi-square to degree of freedom is three and lower it is considered good, and ratios up to five are considered as adequate suitability. A RMSEA value equal to or lower than 0.08, CFI, GFI, NNFI values equal to or higher than 0.90, and an AGFI value equal to and higher than 0.90 shows a good level of suitability. After GFI of the scale was analyzed, ratio of chi-square to the degree of freedom was calculated as 1.64. This ratio lower than three is qualified as perfect suitability in the literature. Moreover, GFI value, which is considered a significant indicator of suitability and is expected to be at 0.90 level for an acceptable model, was found to be 0.85, and the AGFI 0.80. Even though obtained GFI value was below the threshold value, it is quite close to this value. Values of these indices are affected by sample size. Since the sample of the study group included <200 participants, it may be more appropriate to analyze the goodness of fit indices which are not affected by the sample size. Therefore, the focus was on CFI, NFI, and NNFI. Values above 0.90 level for these indices show that the model is acceptable (Çokluk et al., 2014).

One of the methods that determines the reliability of a scale is item total correlation. Item total correlation coefficient should be lower than 0.20 (Tavşanlı, 2014). Kim and Shin (2016) reported the item total

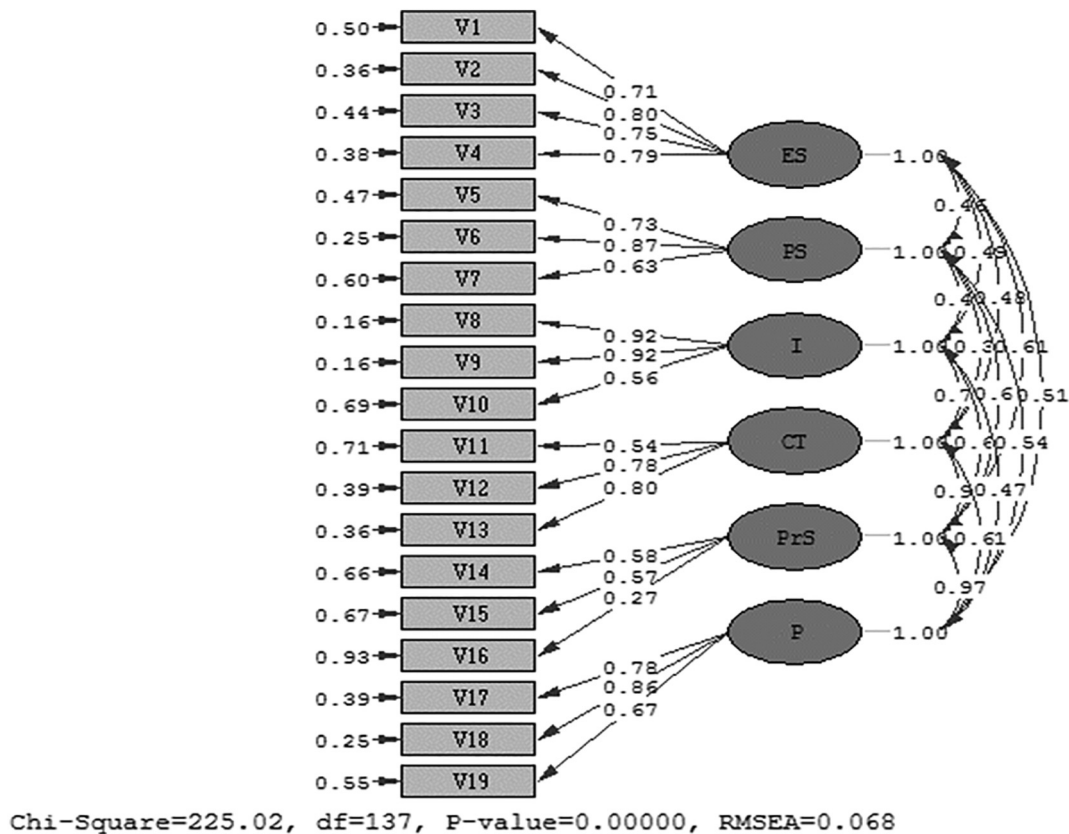


Fig. 1. Confirmatory factor analysis path diagram of the scale.

correlation coefficient of the scale as 0.21–0.59. Item total score correlations of the scale ranged between 0.26 and 0.66 in this study (Kim & Shin, 2016). Item total score correlations of the DSCS-N were at an acceptable level and there are no items that should be removed from the scale because they were not below 0.20. Moreover, Hotelling's T-squared analysis provides information about whether the current measurement tool effectively measures the phenomenon that is intended to be measured. This test is used to determine whether means of questions' scores are equal (Özdamar, 2004). Hotelling T² value, calculated to determine whether scale items were similarly perceived by nurses, was at a significant level ($p < 0.001$). In this context, DSCS-N is effective at measuring nurses' competency of developmental care. Moreover, DSCS-N is regarded as a strong and genuine scale composed of homogeneous questions.

Another value commonly used in determining reliability of scales is Cronbach's alpha reliability coefficient. In the literature, Cronbach's alpha internal consistency coefficient is expected to be close to one (Gözüm & Aksayan, 2003). Cronbach's alpha coefficient between 0.00 and 0.39 means not reliable, between 0.40 and 0.59 means low reliability, between 0.60 and 0.79 mean rather reliable, and between 0.80 and 1.00 mean high reliability (Tavşanlı, 2014). Kim and Shin (2016) stated that Cronbach's alpha coefficient was 0.83 and reliability of the subscales ranged between 0.60 and 0.76 (Kim & Shin, 2016). Cronbach's alpha value was detected as 0.87 in Park and Kim's study (2019) (Park & Kim, 2019). DSCS-N's Cronbach's alpha coefficient was found to be 0.90 in this study. This value shows the scale is highly reliable.

According to time invariance analysis, performed to determine the reliability of the scale, correlation of the general scale was positive ($r = 0.99$) and highly significant ($p = 0.000$). It was found that nurses' responses to the scale items at two different times were consistent and did not change over time.

Limitations

The study was carried out only in neonatal intensive care units of two hospitals in one region of Turkey. The limitation of our study is that our sample may not reflect the global developmental care competency of nurses in the neonatal intensive care unit. The results cannot be generalized.

Conclusion

The findings of the study revealed that the validity and reliability of the Turkish version of the DSCS-N, was a valid and reliable measurement tool. This scale will assist nurses working in the neonatal intensive care unit to determine their developmental care competency. The scale can be used to determine the developmental care methods in which health professionals are not competent, so they can plan necessary interventions. The scale can contribute to developmental care practices in neonatal intensive care units.

Previously there was no valid and reliable scale to measure NICU nurses' competency of developmental care in Turkey. The scale, whose validity and reliability was determined in this study, is the first study in this field. Studies with larger sample sizes involving multiple NICUs are warranted.

Contributors' statement

All the authors contributed to the concept and design, acquisition and interpretation of data, drafting the article and gave final approval of the version to be published.

Table 3
Reliability of Developmental Support Competency Scale for Nurses.

Subscales	Items	Mean ± SD	Corrected item total correlation	Cronbach's alpha if item deleted	Cronbach's alpha of subscales
Environmental support	1. I provide positive sensory input like eye contact and keep patting.	3.39 ± 0.58	0.53	0.89	0.85
	2. I Provide gentle handling and postural support for physiologic stability when neonate cry and display jitter.	3.46 ± 0.59	0.59	0.89	
	3. I make an effort to protect sleep cycles and to avoid sleep interruption by covering incubator from the bright light.	3.63 ± 0.57	0.56	0.89	
	4. I Apply the pillow and blanket for postural support of premature newborn.	3.51 ± 0.59	0.53	0.89	
Parental support	5. I respect the opinion of the parents for nursing care plan.	3.03 ± 0.63	0.48	0.89	0.78
	6. I make an effort to be with parents during visiting hours in NICU.	3.23 ± 0.68	0.55	0.89	
	7. I ask about the parent's informational need and concern for the development of premature newborn.	3.08 ± 0.69	0.52	0.89	
	8. I apply feeding technique according to feeding response of premature newborn	3.71 ± 0.49	0.61	0.89	
Interaction	9. I feel responsibility about progress or health condition of premature newborn.	3.78 ± 0.45	0.57	0.89	0.81
	10. I think that premature newborn can express behavioral cues about their state or need.	3.51 ± 0.54	0.59	0.89	
	11. I integrate the knowledge of growth and development on decision making for neonatal care.	3.51 ± 0.54	0.48	0.89	
Critical thinking	12. I utilize knowledge related to neonatal development for the care of premature newborn.	3.65 ± 0.48	0.57	0.89	0.74
	13. I modify care and priorities in accordance with developmental needs.	3.64 ± 0.50	0.59	0.89	
Professional development	14. I utilize up to date knowledge for nursing practice.	3.52 ± 0.57	0.50	0.89	0.67
	15. I educate and communicate with parents to promote nurturing competence for premature newborn.	3.56 ± 0.50	0.57	0.89	
	16. I participate conference and seminars by own learning plan.	3.06 ± 0.58	0.26	0.90	
	17. I can express my opinion without offending anyone with contrary view.	3.29 ± 0.59	0.57	0.89	
Partnership	18. I communicate with other nurses and health professionals for developmental support.	3.40 ± 0.61	0.66	0.89	0.81
	19. I share important information about premature newborn with parents.	3.37 ± 0.58	0.60	0.89	
Hotelling's T2 Scale average		289.372 65.33 ± 6.48	F = 14.10	p = .000	

Ethics

The study was approved by the Clinical Research Ethics Committee of the Faculty of Medicine (IRB number: E.74826, Approval date: 06.03.2019).

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

CRediT authorship contribution statement

Ayşe Kahraman: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing. **Sibel Serap Ceylan:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources,

Table 4

Comparison of test-retest reliability of the scale and correlations.

Practice time of the scale	Mean ± SD	t	r
		p	p
First measurement	68.00 ± 5.09	1.000	0.997
Second measurement	67.93 ± 5.05	0.326	0.000

Software, Supervision, Validation, Visualization, Writing - original draft, Writing - review & editing.

Declaration of competing interest

The author(s) declare no potential conflicts of interest with respect to their research, authorship, and/or publication of this article.

Acknowledgments

We thank all nursing staff for their collaboration.

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